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Quaternary Fault and Fold Database of the United States

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South Fork Flathead fault (Class A) No. 701

Last Review Date: 2006-05-08

Compiled in cooperation with the Montana Bureau of Mines and Geology

citation for this record: **Haller, K.M., compiler, 2006, Fault number 701, South Fork Flathead fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:02 PM.**

Synopsis	Little known about this long range-front fault that bounds the west side of the Flathead Range. Detailed studies have not been conducted to date. No scarps have been reported along this fault.
Name comments	Source of name is Ostenaa and others (1990 #540). Referred to as the Flathead fault in early work in the region (Clapp, 1932 #997; Erdmann, 1944 #987). Later referred to as the South Fork fault (Bryant and others, 1984 #1027; Sullivan and LaForge, 1988 #541). The most recently used name is preferred here to avoid any possible confusion with structural style attributed to the fault in early publications.

	Fault ID: Refers to fault number 121 (unnamed fault southwest flank of Flathead Range) and fault number 122 (South Fork Flathead River fault) of Witkind (1975 #317).
County(s) and State(s)	FLATHEAD COUNTY, MONTANA LEWIS AND CLARK COUNTY, MONTANA POWELL COUNTY, MONTANA
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* Source of trace is primarily 1:125,000-scale geologic map (without topography) of Johns (1970 #896). Northern and southern ends of fault is from 1:1,000,000-scale fault map of Ostenaa and others (1990 #540). Location of northern end of fault, from Riverside Creek northward, is indicated by Erdmann (1944 #987) to be nearer the present location of eastern shoreline of Hungry Horse Reservoir.
Geologic setting	High-angle or possibly listric, down-to-west, range-front normal fault bounding the southwestern side of Flathead Range. Total displacement across the fault is unknown, but Whipple (1992 #6896) suggests the fault may have over 2000 m of Cenozoic displacement. Qamar and Stickney (1983 #58) suggest late Tertiary displacement is more than 100 m.
Length (km)	147 km.
Average strike	N31°W
Sense of movement	Normal *Comments:* (Johns, 1964 #1051). Early workers (Clapp, 1932 #997; Erdmann, 1944 #987) in this area speculated that movement on a east-dipping high-angle reverse fault (Flathead fault) was the origin of the basin and range topography; but Erdmann did not preclude that the fault might be normal.
Dip Direction	SW
Paleoseismology studies	
Geomorphic	Erdmann (1944 #987) states that "actual scarps have not been

expression	observed". Anderson and LaForge (2001 #6895) confirm this observation; however, they also note that the area is heavily forested making identification of faulted landforms difficult and the area contained valley glaciers and ice fields during the late Wisconsin that may have eradicated all evidence of prior surface rupture. Based on reconnaissance studies, Anderson and LaForge (2001 #6895) defined three sections for the fault based on the distribution of Tertiary basins in the hanging-wall block adjacent to the fault. The fault is not similarly divided here due to lack of data to suggest differences in slip rate or event timing along the fault.
Age of faulted surficial deposits	Johns (1970 #896) shows about 70 percent of the length of the fault at contact between bedrock (Precambrian and Cambrian) units or at or near the bedrock-alluvium contact, but he also indicates that the trace is not well located. Bryant and others (1984 #1027) indicate that Tertiary basin fill is displaced by the fault.
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Erdmann (1944 #987) suggests that there is widespread evidence that movement continued until Sangamon (?) interglacial stage based on the tilt of valley deposits, but deformation of gravels of this age was not reported. Anderson and LaForge (2001 #6895) state that "at several locations, fairly positive evidence that no surface rupturing earthquakes have occurred in approximately the last 11,000 years." Because there is no definitive information on the timing of the most recent movement on this fault, we use a conservative estimate; however, it is possible that movement ceased in the Tertiary as indicated by Bryant and others (1984 #1027).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Lowest slip-rate category assigned based on the absence of scarps on post-glacial deposits. Anderson and Laforge

	(2001 #6895) state that the absence of surface rupture in the past 11 k.y. suggests that the slip rate is less than that of the Mission fault [699b]. Based on that line of evidence and the length of each respective section, they assign a preferred slip rate of 0.2 mm/yr to the southern two segments and 0.1 mm/yr to the northern segment.
Date and Compiler(s)	2006 Kathleen M. Haller, U.S. Geological Survey
References	#6895 Anderson, L.W., and LaForge, R., 2001, Seismotectonic study for Hungry Horse Dam, Hungry Horse Project, and Gibson Dam, Sun River Project, Montana: U.S. Bureau of Reclamation Seismotectonic Report 2001-5, 68 p. #1027 Bryant, M.B., Garrison, P.B., Winston, D., Tucker, T., French, D.E., and Binda, P., 1984, 1984 Field Conference road logs—Kalispell—Waterton—Fernie Basin—Rocky Mountain trench, *in* McBane, J.D., and Garrison, P.B., eds., Northwest Montana and adjacent Canada: Montana Geological Society, 1984 Field Conference and Symposium, p. 331-338. #997 Clapp, C.H., 1932, Geology of a portion of the Rocky Mountains of northwestern Montana: Montana Bureau of Mines and Geology Memoir 4, 30 p., 1 pl., scale 1:500,000. #987 Erdmann, C.E., 1944, Part 2. Hungry Horse Dam and Reservoir site, South Fork Flathead River, Flathead County, Montana, *in* Geology of dam sites on the upper tributaries of the Columbia River in Idaho and Montana: U.S. Geological Survey Water-Supply Paper 866-B, p. 37-116, 4 pls. #1051 Johns, W.M., 1964, Progress report on geologic investigations in the Kootenai-Flathead area, northwest Montana—6. Southeastern Flathead County and northern Lake County: Montana Bureau of Mines and Geology Bulletin 42, 66 p., 3 pls. #896 Johns, W.M., 1970, Geology and mineral deposits of Lincoln and Flathead Counties, Montana: Montana Bureau of Mines and Geology Bulletin 79, 182 p., 3 pls., scale approx. 1:125,000. #540 Ostenaa, D., Manley, W., Gilbert, J., LaForge, R., Wood, C., and Weisenberg, C.W., 1990, Flathead Reservation regional seismotectonic study—An evaluation for dam safety: U.S. Bureau

	of Reclamation Seismotectonic Report 90-8, 161 p., 7 pls. #58 Qamar, A.I., and Stickney, M.C., 1983, Montana earthquakes, 1869-1979—Historical seismicity and earthquake hazard: Montana Bureau of Mines and Geology Memoir 51, 79 p., 3 pls. #541 Sullivan, J.T., and LaForge, R.C., 1988, Seismic sources and maximum credible earthquakes for Willow Creek Dam, Sun River Project, Montana: U.S. Bureau of Reclamation Seismotectonic Report 88-12, 15 p., 2 pls. #6896 Whipple, J.W., compiler, 1992, Geologic map of Glacier National Park, Montana: U.S. Geological Survey Miscellaneous Investigations Series Map I-1508-F, Scale 1:100,000. #317 Witkind, I.J., 1975, Preliminary map showing known and suspected active faults in western Montana: U.S. Geological Survey Open-File Report 75-285, 36 p. pamphlet, 1 sheet, scale 1:500,000.